

Threat of Local Transmission of Zika Virus in California

[Announcer] This program is presented by the Centers for Disease Control and Prevention.

[Sarah Gregory] Hi, I'm Sarah Gregory, and today I'm talking to Dr. Charsey Porse, an epidemiologist at the California Department of Public Health. We'll be discussing Zika cases in travelers returning to California.

Hi, Dr. Porse.

[Charsey Porse] Hi, Sarah. Thank you for having me.

[Sarah Gregory] So, the Zika virus has been around for quite a long time, but it seemed to be lying low. The EID journal published an article and did a podcast in 2011 about an early case of sexually transmitted Zika virus, and then we didn't hear much about it until all the birth defects news in 2015. Can you give us a little bit of the history of the virus?

[Charsey Porse] Sure. As you said, researchers have known about the Zika virus since the late 1940s. It was actually isolated from a monkey that was part of a yellow fever study in Uganda. Then we didn't really hear about it until 2007. The virus resurfaced, quite a ways from Africa, in islands in the Pacific Ocean, and it caused an outbreak in the Federated States of Micronesia. The next outbreak, then, wasn't really 'til 2013, again quite a distance away, in French Polynesia, and that outbreak spread to other Pacific islands. And, you know, during these outbreaks, Zika was actually considered a really mild febrile illness. It wasn't until 2015 that local transmission first appeared in the Americas, with the outbreak that began in Brazil, and then, as you said, Zika became associated with microcephaly and other birth defects.

[Sarah Gregory] So, how is Zika transmitted, and did it spread as quickly as it seemed in 2015?

[Charsey Porse] Uh-huh. So, Zika is most commonly spread by the bite of an infected Aedes mosquito, specifically 1 of 2 species: Aedes aegypti or Aedes albopictus. And one or both of these species are abundant throughout most of South America, Central America, Mexico, and parts of the United States. Zika can also be transmitted from a mother to her fetus; it can be transmitted sexually; and it's likely transmitted through blood products.

And you're right, Sarah, Zika did spread really rapidly in 2015 and 2016. And this was largely, in part, to the virus spreading through an entirely naïve population, meaning that this population of people had never been exposed to the Zika virus, so they had no immunity whatsoever. Luckily, though, the spread of Zika has now drastically slowed down throughout South and Central America, as well as in Mexico, and we have not had any locally transmitted cases in the US since 2016.

[Sarah Gregory] So, you work for the California Department of Public Health. Is California particularly susceptible to the Zika virus for some reason?

[Charsey Porse] Well, California, along with several other states, has multiple factors that contribute to it having a higher—not high—higher risk of local transmission than other places in the US. I think the most important factor there is that, since 2011, we've been identifying an increased number of these vector Aedes mosquitoes, mostly in southern California and also along the Central Valley region. I think it's also important that California's proximity to Mexico

is going to increase our risk of local transmission. You know, that's due to the fact that Zika spread through Mexico and also that we have a lot of cross-border traffic.

The other important factor, I think is, you know, in order for there to be local transmission, a mosquito has to bite an infected person. So, California reported, you know, one of the highest number of travel-related cases of Zika in the US. And this high number of returning infected travelers is going to increase the chance that an individual could be bitten by one of these vector mosquitoes and initiate local transmission.

Now, all that said, if we were to have local transmission, I would really expect it to be limited, you know, due to the close coordination of our vector-control agencies and our local health departments, as well as, you know, the really common use of air conditioners, screens, and windows, and doors that are going to really help keep those mosquitoes outside of the home. And then, even though we do have these detection of Aedes mosquitoes in California, in a lot of places they're patchy, so there is a veritable distribution of them throughout the state.

[Sarah Gregory] Okay, so why did you decide to do your particular study and what were you looking for?

[Charsey Porse] Well, ultimately, our aim was to better assess the potential threat of local Zika transmission in California. But once the outbreak began to slow down and we had time to actually think about our data, then we wanted to assess trends of infected individuals to be able to provide a summary of California Zika cases, to really help increase the public health knowledge available about Zika, because we feel like it's pretty limited at this time.

[Sarah Gregory] Would you describe your methods used to conduct this particular study?

[Charsey Porse] Ah sure. So, Zika virus is a nationally notifiable disease. And what that means is that, all patients who test positive for Zika in California, must be reported to the California Department of Public Health. So, because of that, we have most of the demographic, clinical, epi data for all of the Zika cases reported in California. And that allowed us to be able to analyze data pertaining to age, travel location, length of travel, symptoms, whether or not the women were pregnant at the time of their diagnosis, along with some other variables.

And then there was a laboratory component of our study, and most of the Zika cases were largely tested at CDPH's Viral and Rickettsial Disease Laboratory. And this testing included PCR, which can detect for viral RNA present in a person's blood, as well as serology, which detects antibodies that are generated by a person's immune system to the virus.

And then we also had a mosquito surveillance component of the study. And, as I mentioned, you know, California has a network of local vector control agencies, and their main job is to monitor the distribution and abundance of mosquitoes, specifically these Aedes vector mosquitoes. And that surveillance usually includes trapping and identifying the mosquitoes, but we were able to augment that surveillance, with the help of the University of California–Davis, and they were able to do Zika testing on the mosquitoes, as well as some other arboviruses, like dengue or chikungunya. And then, based on that mosquito surveillance, we were actually able to generate maps, that enabled the spatial and temporal mapping of mosquito populations in relation to our Zika case patients, which, again, is really important if we want to identify places that would be more likely to have local transmission.

[Sarah Gregory] Okay, so what did you find? Were there any cases of locally transmitted Zika? I think you already said that there were not. So were they all traveler related?

[Charsey Porse] Right, you're correct, there were not any locally transmitted cases. What we did find was that, between November 2015 and September 2017, so basically the first 2 years of the outbreak, there were 588 Zika cases that were reported to us at CDPH. And these included 139 infections in women that were pregnant, 10 congenital infections, and then 8 of the infections were sexually transmitted.

At the time that we did our study, 120 of the pregnant women had completed their pregnancies, with 114 live births and, unfortunately, there were 6 fetal losses. The live births did include 6 infants that were born with Zika-related birth defects, including microcephaly. And then the other thing we actually were able to find was that about 25% of our cases did not have any symptoms common with the Zika infection, so no joint pain, rash, conjunctivitis, or fever. Location of travel was also of particular interest to us, and we found—not surprising, given the proximity—that 36% of our Zika-case patients had traveled to Mexico, while 34% had traveled somewhere else in Central America, and 13% had traveled to the Caribbean.

And then, as I mentioned, we were also very concerned about the colocation of these Aedes vector mosquitoes and individuals who'd been infected with Zika, because again, that could lead to local transmission. And so, what we found was that 75% of our Zika-case patients returned from their travel to California while they were still viremic. And what that means is that they still had virus in their blood, so they would still be capable of infecting a vector mosquito, if they happen to be bitten. And so, of those viremic case patients, we found that 64%, so more than half, resided in a California county where Aedes mosquitos had been detected. So, that was obviously quite alarming to us.

But, as we already said, you know, there was no local transmission identified in California, which is a very good thing. All of the cases were travel related. They had either traveled themselves, were sexual partners of someone who had traveled, or were infants that had been exposed by their mothers.

[Sarah Gregory] So, after looking at your study, you were trying to find people who potentially had the Zika virus, without needlessly testing a lot of low-risk people. Were you able to do this and establish some criteria for local health departments?

[Charsey Porse] Yeah, so we were able to establish criteria that helped local health departments target their testing. But let me stop for a minute and give you a little bit of background here before I go on. If...if you test individuals with a low risk of having a disease, you're going to increase your chances of getting a false positive, or someone who tests positive, but doesn't really have the disease. So, we really wanted to keep this in mind while also being open to testing an individual who hadn't traveled, but potentially could have been a locally transmitted case, and Zika was really suspected.

So, we decided to conduct an analysis of our Zika symptom data and we did this early in 2016, fairly early into the outbreak. And we found that 90% of our symptomatic cases had a rash. So, based on that, we advised our local health departments, if they had a person who was a resident of a county with the Aedes vector mosquitos and the patient presented to the provider with a rash, as well as 1 other symptom common to Zika, and all other illnesses had been ruled out, then

that provider might want to consider testing that individual for Zika, even though they hadn't traveled. And so, by using this criteria, we were hoping to be able to limit the number of low-risk individuals tested. And we did actually have individuals who met this criteria and they were tested, but thankfully, none of them were found to be infected with Zika.

[Sarah Gregory] You mention in your article that, like chikungunya, the number of Zika cases is decreasing. Why would this be?

[Charsey Porse] Well, Zika and chikungunya are both viruses that impart lifelong immunity on a person once they've been infected. The same is actually true for dengue, but it becomes a little more complicated because there's 4 serotypes, so different things happen with reinfection. But it would be a similar situation there. But, as chikungunya spread quickly across the Americas in 2014, what happened was a large population of people became infected. And this led to those individuals not being able to become infected again, but it also created a really strong herd immunity, helping to protect those in the population who had not been infected. And that's really similar to what we've seen with Zika. It spreads really quickly through a naïve population, but the result was that a large percent of that population is now immune. Now, that said, herd immunity is not 100% protective, so we would expect to continue to see isolated cases of Zika and chikungunya in areas that have had local transmission in the past.

[Sarah Gregory] Can you explain to our listeners exactly what "herd immunity" means?

[Charsey Porse] Sure. It's when you have a large percent of the population that has been infected, so therefore, they can't get the virus, and they're able to kind of shield those people who haven't been infected yet, because the mosquito's going to stand a higher percentage of a chance of biting somebody who can't be infected, so the virus won't be able to keep circulating.

[Sarah Gregory] What does all this mean for public health? Are women able to stop worrying about getting the Zika virus, or at the worst, if they do get it, can they feel confident that they can be accurately tested and treated?

[Charsey Porse] So, I mean, it's obviously great news that the number of reported cases of Zika are decreasing across the Americas—great news! But there is still limited active transmission in most of those countries. So, we're still warning pregnant women that Zika infection is possible and they should really limit their travel to those locations. If they must travel, then we're still recommending that they take precautions, such as wearing an effective mosquito repellent.

First, testing—you know, the testing with Zika evolved greatly during the outbreak, but there are still a lot of issues associated with interpreting the results, especially in light of the cross-reactivity that there is with the dengue virus. You know, there is, you know, no real treatment, there's no cure for Zika, so if a pregnant woman becomes infected, you know, we highly recommend she work closely with her obstetrician to try to monitor the fetus. But, you know, there's just no way to know whether infection with Zika virus will lead to any issues of fetal development. There's just no way to know that in advance.

[Sarah Gregory] Dr. Porse, what's your job at the California Department of Health? How did you become involved in this Zika study?

[Charsey Porse] Well, I'm an epidemiologist in the vector-borne disease section at the California Department of Public Health. And traditionally, my responsibilities have included reviewing all

the Aedes-transmitted diseases, like dengue and chikungunya. So, when, you know, Zika came on the scene, I emerged as the lead epidemiologist for Zika case surveillance. So, it was my responsibility to work closely with the local health departments, to follow up on case investigations, especially to help enhance our surveillance in order to prevent and rule out cases of local transmission.

And then, you know, the thing about the Zika outbreak to me is that it really provided a great opportunity to work across many agencies in the state, but also with the CDC. And, you know, I was very impressed with everyone's efforts to help detect and prevent local transmission of Zika across the United States.

[Sarah Gregory] Thank you, Dr. Porse. Listeners can read the full article, Travel-Associated Zika Cases and Threat of Local Transmission during Global Outbreak, California, USA, online at cdc.gov/eid.

I'm Sarah Gregory for *Emerging Infectious Diseases*.

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